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Forecasting technique of price of potato of Uttar Pradesh

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Abstract

The development of suitable statistical models for forecast of based on time series data on price of potato crop of Uttar Pradesh has been illustrated in the present paper. The data obtained from the website of Directorate of Economic of statistics (Sankhikey bulletin of statistics) develop the model. The result has revealed that the proposed model can provide reliable forecast of price of potato. Range of per cent standard error of 24 to 35 percent and R^2 was 73 percent.

Keywords: Forecasting technique, economic, statistics, reliable forecast

Introduction

Agriculture is backbone of Indian economy but the growth of agriculture and allied sectors is still a critical factor in the overall performance of the Indian economy. As per the year 2010-16, advance estimates released by the Central Statistics Office (CSO) on 07.02.2016, the agriculture and allied sector accounted for 14.2 per cent of the Gross Domestic Product (GDP), at constant year 2004-05 prices.

Vegetables are very important components of human diet. They are major sources of vitamins and minerals for health. India is the second largest vegetable producer of the world behind china. India producer about 162.9 million tonnes of vegetables from an area of 9.4 million hectares with an average productivity 17.3 tonnes/ha during 2014-15 (Indian institute of vegetable research varman vision document 2050). Most of the vegetable in of short growth period and of higher perish ability. Output variation maker fluctuation in price and become riskier for vegetable growers.

Potato in the most important vegetable of the country contributing about 21 percent and 25.5 percent in area and production respectively, of the world. India produced potato about 46 million tonnes during 2014-15 directorate of economics and statistics govt. of India 2016

Utter Pradesh in the leading state of the country in potato production Uttar Pradesh has produced 13.14 million tons of potato in 6.04 hectare area during 2014-15 with productivity of 225.2 kg/ha during 2014-2015 Its share in the country production is 25059 percent while area contribution is 29.20 percent. its production is higher than national average of 222.10 q/ha. Next to up is west Bengal followed by Bihar state.

Price forecasting is an integral part of commodity trading and price analysis. Quantitative accuracy with small errors, along with turning point forecasting power is important for evaluating forecasting models. Agricultural commodity production and prices are often random as they are largely influenced by eventualities and are highly unpredictable in case of natural calamities like droughts, floods, and attacks by pests and diseases. This leads to a considerable risk and uncertainty in the process of price modelling and forecasting. Agricultural commodity prices play an important role in consumers' access to food as they directly influence their real income, especially among the poor who spend a large proportion of their income on food. Since food price is an important component to fight hunger, policy makers need reliable forecasts of expected food prices in order to manage food security. Before the onset of liberalization and globalization, the government was controlling food prices, thus rendering food price forecasting a low value-added activity.

Materials and statistical Methodology

Time series data on monthly price potato in different districts of Utter Pradesh (UP) since year 2000to 2014 were obtained from the website of Directorate of Economic of statistics (Sankhikey bulletin of statistics). The monthly price of potato was further aggregated for different agro-climate zones of UP and also for overall UP. The monthly price data were further aggregated over year for zones and UP.

Time series data on the following items since 2000-2001 to 2014-2015 were also obtained from aforesaid organization.

Area under potato (in hectare), Production of potato (in tons/hectare), productivity (yield) of potato (in tons), No. of Mandies in U.P., No. of cold-storage in U.P. and Energy consumption. Population census data of Uttar Pradesh at census year 1981, 1991, 2001, and 2011 were also obtained. Population data for the year 2014-15 was projected using the growth rate of population between 2001 and 2011.

Forecasting of price

1. The fitted function $Y_t = a + b^t$ will be used to forecast the price of subsequent years.
2. Forecasting of price of potato using area production and yield of potato as independent variables will be done by fitting the following linear regression equation using least square technique

$$y_t = a + b x_t + u_t,$$

Where

y_t : price of potato at time t
 x_t : area/production/yield of potato at time t
 $(t=1, 2, n)$

and other notations have usual meaning.
 Let the fitted regression equation is given by

$$Y_t = a + b^t x_t$$

The forecast of price of potato for subsequent years will be obtained by putting the value of x_t in subsequent years.

Factors affecting potato price in U.P. and forecasting of price based on these factors.

To study the effect of some relevant factors on price of potato, the following multiple regression equation has been considered

$$Y_t = a + b_1 X_{1t} + b_2 X_{2t} + b_3 X_{3t} + b_4 X_{4t} + u_t, t=1, 2, \dots, n$$

Where

y : Price of potato at year t
 X_{1t} : No. of Mandi at year t
 X_{2t} : No. of cold-storage at year t
 X_{3t} : Energy consumption at year t
 X_{4t} : yield (tone/ha) at year t
 U_t : Error term assumed to follow normal distribution with mean zero and variance

Results and Discussion

Forecast of price of Potato

4.2.2.1 Forecast of price based on simple linear regression model when time index is an independent variable. The following regression models

$$Y_t = a + b t + \mu_t, t = 1, 2, \dots, 12$$

was fitted with data, where Y_t = price of potato during the year t ($t = 1, 2, \dots, 12$), t is time index, a & b are parameters of regression equation, μ_t is error term assumed to follow normal distribution with mean zero and variance σ^2 . The time series of price pertaining to the period 2000 to 2011 were used for fitting the data least square technique. Price of potato was forecasted for the year 2012, 2013 and 2014 using the fitted regression model. The fitted model along with forecast of price are presented.

Table 1: Estimated Regression Line with Time Index as an Independent Variable and Forecast of Price

Estimated Regression Line	R ²	Forecast of Price			
		Year	Forecast Price	Actual Price	% Deviation
Y=3.58+0.51t*	72.73	2012	10.21	13.53	-24.56
		2013	10.71	15.84	-35.45
		2014	11.22	17.39	-35.45

It can be observed from the results of the table 1 that the effect of time index was found to be significant on potato price at $p \leq 0.01$. The value of R^2 was considerably high, i.e. about 73 percent. Forecast of price of potato for the years 2012, 2013 and 2014 are presented in the table 1. It can be seen from the table that the forecast price of potato was near to actual price of potato during these years of forecast. The percent deviations of forecast prices from actual prices were about 24 to 35 percent.

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